

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/93	Adams County Quincy Landfills 2 and 3	Quincy	IL	Municipal Industrial Hazardous Liquid	VOCs	Leachate Groundwater	The site overlies Mississippian-aged Keokuk-Burlington limestone bedrock. Groundwater movement is influenced by fractures within the limestone bedrock. The Keokuk-Burlington limestone formation is a significant regional aquifer and provides water to most area municipal and domestic wells.	The selected remedy includes institutional controls such as access restrictions; deed restrictions to prohibit on-site groundwater use and building construction; use of a public water supply to replace groundwater well use; ongoing leachate collection, treatment, and monitoring; and groundwater monitoring. If groundwater monitoring results show that cleanup levels are not met and maintained, additional action will be taken.	Construction/Capital: \$997,780 O&M: \$216,702 Present Worth: \$3,040,611
03/28/95	Albion-Sheridan Township Landfill	Albion	MI	Municipal Industrial Hazardous (including metal plating sludge)	VOCs Heavy metals Inorganics	Drums Landfill cover Landfill gas Groundwater	The landfill is dug into a series of unconsolidated sand, gravel, silt, and clay units. Groundwater in the unconsolidated units is in contact with bedrock of the Marshall Formation. The upper 5 to 25 feet of the Marshall Formation is highly weathered and fractured.	The selected remedy includes removal, off-site treatment, and disposal of drums containing hazardous and liquid wastes; institutional controls on land and groundwater use until cleanup standards are attained; construction of a solid waste landfill cover with a flexible membrane liner; installation of an active landfill gas collection system; and groundwater monitoring. If the arsenic contamination in groundwater does not decline after 5 years after cap installation or if contamination threatens residential wells, groundwater will be treated using in situ oxidation.	Construction/Capital: \$2,654,734 O&M: \$1,197,801 Present Worth: \$3,852,535 Contingency Implementation: Construction/Capital: \$ 3,086,196 O&M: \$ 1,345,923 Present Worth: \$ 4,432,119
06/29/88	Belvidere Municipal Landfill	Belvidere	IL	Municipal Industrial Drums Hazardous	Metals (especially lead) Organics PAHs PCBs	Groundwater Soil	The site overlies an upper aquifer that consists of approximately 100 feet of sand and gravel. The upper aquifer overlies a lower bedrock aquifer consisting of Galena Formation dolomite. The lower aquifer is not used as a source of drinking water but has the potential for such use in the future.	The selected remedy includes institutional controls, including deed restrictions on future use; installation of fencing; flood control measures; landfill capping; plume barrier groundwater extraction and treatment; and groundwater monitoring.	Construction/Capital: \$ 5,900,000 O&M: \$ 271,000 Present Worth: \$7,900,000

EPA Region 5 Records Ctr.



206223

07/23/98

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/91	Berlin & Farro	Swartz Creek	MI	Liquid Drum	VOCs Metals	Soil Sediment Groundwater	The site overlies a glacial till layer approximately 120 to 150 feet thick. The glacial till in turn overlies Saginaw Formation bedrock. Two aquifers are located under the site: one in the unconsolidated material and one in bedrock. The bedrock aquifer is typically fractured, and groundwater flow is therefore not limited to one direction. Both aquifers are used locally as sources of drinking water.	The selected remedy includes institutional controls, including deed restrictions on drinking water wells; excavation, partial treatment, and containment of approximately 48,000 cubic yards of contaminated soil and sediment in a RCRA Subtitle C/64 cell; treatment of any leachate collected from the cell; installation of a landfill cap; extraction of contaminated groundwater and treatment by air stripping; off-gas treatment; and groundwater monitoring.	Construction/Capital: \$ Not stated O&M: \$ 233,100 Present Worth: \$8,119,300
02/29/84	Berlin & Farro	Swartz Creek	MI	Liquid Drums	PCBs Metal hydroxides Solvents VOCs	Air Sludge Drums Soil Surface water	The site overlies a glacial till layer approximately 120 to 150 feet thick. The glacial till in turn overlies Saginaw Formation bedrock. Two aquifers are located under the site: one in the unconsolidated material and one in bedrock. The bedrock aquifer is typically fractured, and groundwater flow is therefore not limited to one direction. Both aquifers are used locally as sources of drinking water.	The selected remedy includes excavation of the drum landfill, paint sludge trench, agricultural drains, and miscellaneous areas to remove sludge, liquid, crushed drums, and visibly contaminated soil; separation of PCB solid wastes from non-PCB solid wastes and off-site transport of wastes; transport of PCB-contaminated liquid wastes, if any, to off-site incinerator; pumping of non-PCB liquid wastes from the drum landfill and transport to an off-site incinerator; and backfilling of excavated areas. Several removal actions involving tanks, drums, liquids, and sludge were performed before remedy selection.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated
03/31/89	Bower's Landfill	Pickway County	OH	Municipal Industrial Chemical	PCE Benzene PAHs PCBs Lead Chromium	Soil Sediment Groundwater	The site overlies 40 to 100 feet of glacial deposits which in turn overlie shale bedrock. The glacial deposits are part of an extensive aquifer system that underlies the Scioto River flood plain. Two aquifers exist in the glacial deposits and may be hydraulically connected. Both aquifers are used locally as a source of drinking water. Bedrock below the glacial deposits is an aquiclude and is not used as a water supply source.	The selected remedy includes institutional controls to restrict site access; management of surface debris; installation of a natural clay cover; and groundwater monitoring.	Construction/Capital: \$ Not stated O&M: \$ 116,000 Present Worth: \$4,300,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/29/92	Butterworth No. 2 Landfill	Grand Rapids	MI	Municipal Industrial Liquid	VOCs PCBs Pesticides Metals	Soil Debris	The site overlies bedrock formations of sedimentary origin. The bedrock strata in the area are covered almost everywhere by glacial drift deposits. Groundwater in the area is located in both bedrock and the unconsolidated glacial drift deposits and is used by practically all the population and industry in the area, including the cities of Grand Rapids, East Grand Rapids, Walker, and Wyoming. Groundwater flows from the site to the Grand River.	The selected remedy includes construction of a Michigan solid waste landfill cap; establishment of alternate concentration limits for site-specific contaminants of concern in groundwater; grading and leveling of the site; removal of exposed drums containing hazardous materials; improvement of cap construction with the inclusion of a frost protection layer; and monitoring groundwater, river water, and river sediment. Prior to this remedy selection, a hot-spot removal action was completed that resulted in the removal and off-site disposal of approximately 1,100 tons of material. The hot spot contained PCBs at concentrations up to 800 mg/kg and chromium at concentrations up to 43,000 mg/kg.	Construction/Capital: \$ 13,530,000 O&M: \$ 110,000 Present Worth: \$15,230,000
09/28/92	City Disposal Sanitary Landfill	Dane County	WI	Municipal Construction Debris Industrial Liquid	VOCs Phenols Metals Inorganics	Soil Debris Groundwater	The site is located within the Milton Moraine. Two aquifer systems underlie the site. The uppermost aquifer consists of glacial deposits and a deeper bedrock aquifer (which has not been described). Groundwater in the glacial deposits recharges the bedrock aquifer.	The selected remedy includes restrictions to prohibit groundwater use; groundwater extraction, chemical oxidation treatment, and discharge to surface water; groundwater monitoring; construction of a Subtitle D cap over most of the site and a Subtitle C cap over areas with industrial waste; landfill gas venting and treatment; and in situ vapor extraction of volatile wastes from two landfill cells; and on-site treatment of extracted vapor.	Construction/Capital: \$ 5,187,066 O&M: \$ 736,837 Present Worth: \$14,851,387

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
01/31/92	Columbus Old Municipal Landfill	Columbus	IN	Municipal	NA	NA	The site overlies complex, heterogeneous deposits of unconsolidated recent and Pleistocene-aged deposits, including several layers of glacial till that overlie shale bedrock. Groundwater is present in the shallow unconsolidated aquifer beneath the site.	The selected remedy, modified no action, includes installation of fencing and warning signs; a landfill cover maintenance program; periodic leachate seep inspections; development of a groundwater recovery system implementation plan; installation of additional groundwater monitoring wells; groundwater monitoring; and institutional controls to reduce site access and on-site land and water use.	No cost associated with remedy.
06/30/93	Dakhue Sanitary Landfill	Cannon Falls	MN	Municipal Commercial Industrial (small amounts)	VOCs Phenols Metals	Groundwater	The site overlies two aquifers: a sand and gravel aquifer and the Prairie du Chien/Jordan Aquifer. Groundwater in the sand and gravel aquifer discharges into the Cannon River. The Prairie du Chien/Jordan Aquifer is a sandy dolomite bedrock aquifer. Groundwater flow within the dolomite aquifer is primarily within joint fractures and bedding planes.	The selected remedy includes institutional controls to restrict well development and long-term groundwater monitoring.	Construction/Capital: \$ 360.00 O&M: \$ Not stated Present Worth: \$ 360,000
06/28/91	Dakhue Sanitary Landfill	Cannon Falls	MN	Municipal Commercial Industrial (small amounts)	VOCs Phenols Metals	Soil Debris	The site overlies two aquifers: a sand and gravel aquifer and the Prairie du Chien/Jordan Aquifer. Groundwater in the sand and gravel aquifer discharges into the Cannon River. The Prairie du Chien/Jordan Aquifer is a sandy dolomite bedrock aquifer. Groundwater flow within the dolomite aquifer is primarily within joint fractures and bedding planes.	The selected remedy includes installation of fencing; construction of a cap with a final cover system consisting of a gas control layer, a barrier layer of low-permeability material, a drainage layer, and a topsoil cover with vegetation; and air and groundwater monitoring. Treatment options for air emissions from gas vents will be considered after construction of the final cover.	Construction/Capital: \$9,800,000 O&M: \$ 54,000 Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
05/03/96	Douglas Road - Uniroyal, Inc., Landfill	Mishawaka	IN	Industrial Hazardous Liquid	VOCs SVOCs Dioxins PCBs PAHs bis (2-Ethylhexyl) phthalate	Groundwater	The site overlies unconsolidated glacial deposits 30 to 200 feet thick consisting of sand and gravel outwash imbedded with clayey tills and form the St. Joseph aquifer system. In the site area, an intermediate deposit of clay till separates the sand and gravel outwash into upper and lower units. Throughout the area, a basal clay till unit overlies bedrock. Groundwater from the St. Joseph aquifer system is a source of drinking water in the site area.	The selected remedy includes groundwater extraction and treatment through construction of an artificial wetland; reinfiltration of a portion of the treated groundwater and discharge to Juday Creek of the treated groundwater; groundwater and source area monitoring; and long-term operation and maintenance of the remedy.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$6,100,000
07/13/95	Douglas Road Landfill	Mishawaka	IN	Industrial Hazardous Liquid	VOCs SVOCs Dioxins PCBs PAHs bis (2-Ethylhexyl) phthalate	Soil Waste material	The site overlies unconsolidated glacial deposits 30 to 200 feet thick consisting of sand and gravel outwash imbedded with clayey tills and form the St. Joseph aquifer system. In the site area, an intermediate deposit of clay till separates the sand and gravel outwash into upper and lower units. Throughout the area, a basal clay till unit overlies bedrock. Groundwater from the St. Joseph aquifer system is a source of drinking water in the site area.	The selected remedy includes installation of a composite barrier cap with a geosynthetic clay liner; collection and disposal of landfill gas; construction of perimeter ditches to collect surface water drainage; and groundwater and source area monitoring.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$4,700,000
09/07/93	Duell - Gardner Landfill Site	Muskegon County	MI	Municipal Industrial Liquid	bis(2-Ethylhexyl) phthalate Crystal violet (a laboratory stain) Aniline n,n-dimethyl aniline	Soil Groundwater	The site overlies glacial deposits up to 300 feet thick consisting of very fine- to medium-grained sand and gravel. Underlying bedrock consists of Marshall Formation sandstone. Glacial deposits and Lake Michigan supply water in the area.	The selected remedy includes groundwater extraction to capture and halt the flow of the contaminated groundwater plume; groundwater carbon adsorption treatment; excavation of contaminated soil and low- temperature thermal treatment; construction of a clay cap over the former landfill area; and groundwater monitoring.	Construction/Capital: \$ 2,715,000 O&M: \$ 317,000 (yr. 0-10) \$98,000 (yr.10-20) Present Worth: \$5,902,000
03/04/93	East Bethel Landfill	East Bethel	MN	Demolition debris Municipal (small amount) Industrial (small amount)	VOCs Heavy metals (low-level) SVOCs (low-level)	Groundwater	The site overlies the Anoka Sandplain and five Wisconsin-aged glacial units. These five units overlie the Franconia Formation, which is the uppermost bedrock.	The selected remedy includes installation of a groundwater capture system in three of the aquifers; groundwater treatment with metals pretreatment and diffused aeration; additional groundwater aeration treatment through a rip-rap spillway; discharge to Neds Lake; and operation and maintenance activities.	Construction/Capital: \$ 405,909 O&M: \$ 246,605 Present Worth: \$4,196,722

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
06/28/91	Fadrowski Drum Disposal	Franklin	WI	Industrial Hazardous Drums	VOCs Organics (PAHs, pesticides [DDT]) Metals (arsenic, chromium, lead)	Soil Sediment Debris	The site overlies three generalized geologic units consisting of clay till; undifferentiated sand, gravel, silt, and clay; and dolomite bedrock. The dolomite bedrock unit is the primary source of groundwater for domestic wells in the area.	The selected remedy includes hot spot excavation of previously identified drums and associated characteristically hazardous soils; construction of trenches to find and excavate additional containerized waste and associated characteristically hazardous soils; off site recycling or treatment and disposal of drummed wastes; treatment and disposal of contaminated soil; construction of a landfill cap; institutional controls to limit land and groundwater use; and monitoring of groundwater and surface water.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated
06/28/91	Folkertsma Refuse	Walker	MI	Industrial	VOCs Metals Organics PCBs Arsenic Chromium Nickel	Sediment Groundwater	The site overlies four subsurface units that vary in coverage and depth over the site. A surficial glacial and a bedrock aquifer are both used as a source of drinking water.	The selected remedy includes institutional controls such as fencing and deed restrictions to prevent future groundwater use; excavation and dewatering of approximately 1,300 cubic yards of contaminated sediment from an unnamed creek, drainage ditch, and Indian Mill Creek; consolidation of the sediment under a newly constructed landfill cap; conversion of the unnamed creek and drainage ditch to provide for permanent underground site drainage; installation and maintenance of a landfill cap; installation and maintenance of passive landfill gas vents; and long-term groundwater and drainage water monitoring.	Construction/Capital: \$ Not stated O&M: \$ 58,000 Present Worth: \$1,500,000
03/31/88	Forest Waste Disposal	Otisville	MI	Municipal Industrial Liquid Drums	Arsenic Lead Organics PAHs PBBs Pesticides Toluene TCE	Groundwater Soil	The site overlies Wisconsinan-aged glacial deposits, consisting of layers of medium-grained sand and small gravel alternating with layers of silty clay till deposits. The bedrock beneath the glacial deposits is the Pennsylvanian-aged Saginaw Formation. The bedrock consists of interbedded sandstone and shale with some limestone and coal.	The selected remedy includes institutional controls such as fencing and access restrictions; removal and off-site treatment of drums and associated saturated contaminated soil; installation of a landfill cap; installation of a slurry wall and dewatering system; and collection and treatment of the groundwater from the dewatering system.	Construction/Capital: \$ Not stated O&M: \$ 440,500 Present Worth: \$23,820,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
12/21/90	G & H Landfill	Macomb County	MI	Municipal Industrial Liquid	VOCs Organics PCBs Metals Oils	Soil Sediment Debris Groundwater	The site overlies two unconsolidated aquifers. The upper aquifer is unconfined and consists of fine to gravely sand 7 to 46 feet thick. An aquitard consisting of lacustrine and glacial till 20 to 110 feet thick separates the upper and lower aquifers. The lower aquifer consists of fine- to medium-grained sand and some silt. The lower sand aquifer overlies bedrock consisting of sandstone, and in some areas, shale.	The selected remedy includes construction of a landfill cap; construction of a subsurface vertical barrier slurry wall; collection and treatment of leachate from the western perimeter of the landfill; extraction and treatment of the groundwater contaminant plume and discharge into the Clinton River; groundwater aquifer and surface water monitoring; provision of municipal water supply for affected residences and businesses; replacement of affected wetlands; excavation of PCB-contaminated soil and sediment at concentrations exceeding 1 ppm from outside the slurry wall; treatment of PCB-contaminated soil and sediment at concentrations exceeding 500 ppm; consolidation of soil and sediment containing less than 500 ppm PCBs under the landfill cover; and periodic review of emerging in situ treatment technologies to determine if a technology can effectively treat the massive contaminant source hot spot within the landfill.	Construction/Capital: \$ Not stated O&M: \$ 750,000 Present Worth: \$40,000,000
09/06/95	Hechimovich Sanitary Landfill	Williamstown	WI	Municipal Industrial Hazardous Liquid Battery Open burning	VOCs	Groundwater	The site overlies various unconsolidated deposits including: peat, organic silt and clay, brown till, silty gray sand, and sandy gray till. Maquoketa Shale underlies the unconsolidated deposits and acts as a confining layer that restricts contaminant migration. Groundwater flows rapidly within the unconsolidated deposits and discharges to either adjacent wetlands, their drainage ditches, or an area of silty sand.	The selected remedy includes continuation and expansion of current source control measures; expansion of the existing gas extraction system to accelerate the gas extraction, reduce VOC concentrations in landfill wastes, and consequently reduce VOC loading from landfill to groundwater; and groundwater monitoring. Additional measures may be required if the water quality does not improve at an acceptable rate.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/29/90	Hunts Disposal	Caledonia	WI	Municipal Industrial	Benzene TCE Xylenes Acids Metals Arsenic Chromium	Soil Sediment Debris Groundwater	The site overlies two aquifers. The upper unconsolidated aquifer consists of sand and gravel 25 to 35 feet thick. The lower bedrock aquifer consists of dolomite and limestone of the Niagara Formation. The aquifers are hydraulically connected. The limestone aquifer is used as a source of drinking water by area residents.	The selected remedy includes institutional control such as fencing and restrictions on groundwater use; consolidation of contaminated soil and sediment under the newly constructed landfill cap; construction of a multilayer landfill cap; construction of a full slurry wall around the landfill; groundwater gradient control and contaminated groundwater treatment through extraction wells and off-site treatment; construction and installation of an active landfill gas collection and treatment system; environmental monitoring; and additional investigation and study to assist in remedial action design and to assess potential for off- site groundwater contamination.	Construction/Capital: \$ Not stated O&M: \$ 375,000 Present Worth: \$17,454,000
09/30/87	Industrial Excess Landfill	Uniontown	OH	Municipal Commercial Industrial Chemical Liquid	Inorganics Organics VOCs	Groundwater	The site overlies glacial deposits of sand, gravel, silt, and clay 60 to 200 feet thick. Underlying the glacial deposits is bedrock of the Pennsylvania-aged Pottsville Group. Most private wells in Uniontown obtain water from the bedrock aquifer.	The selected remedy includes provision of an alternate water supply to approximately 100 homes located near the site. The selection of the source of alternate water is delayed until initial design activities are complete.	Construction/Capital: \$ 1,021,000 O&M: \$ 34,160 Present Worth: \$1,715,870 - \$2,289,060
07/17/89	Industrial Excess Landfill	Uniontown	OH	Municipal Commercial Industrial Chemical Liquid	VOCs Benzene PCE Methane gas PAHs Metals	Soil Sediment Groundwater Air	The site overlies glacial deposits of sand, gravel, silt, and clay 60 to 200 feet thick. Underlying the glacial deposits is bedrock of the Pennsylvania-aged Pottsville Group. Most private wells in Uniontown obtain water from the bedrock aquifer.	The selected remedy includes institutional controls such as fencing and restrictions on future site use; installation of cap over the entire site with surface water drainage control and discharge; expansion of the existing methane venting system; extraction and treatment of contaminated groundwater beneath and near the landfill; pumping of groundwater to maintain the water table below the level of wastes; and monitoring of the groundwater extraction and treatment and methane venting systems.	Construction/Capital: \$ Not stated O&M: \$ 440,000 Present Worth: \$18,548,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
08/96	Kohler Company Landfill	Kohler	WI	Industrial Manufacturing Hazardous Liquid	VOCs PAHs Metals Inorganics PCBs	Groundwater	The site overlies unconsolidated glacial and alluvial deposits. The unconsolidated deposits are underlain by fractured Niagaran Dolomite bedrock approximately 700 feet thick. Weathering of the buried bedrock surface is evident but not prominent. Groundwater flow in the unconsolidated aquifer is toward the Sheboygan River, which surrounds the site in three directions. Regional groundwater flow in dolomite bedrock aquifer discharges into Lake Michigan. The primary source of drinking water in the area is Lake Michigan; however, bedrock in the site area is the only hydrostratigraphic unit that serves as a viable aquifer.	The selected remedy includes construction of a multilayer landfill cap; construction of a groundwater interceptor drain; natural attenuation to restore contaminated groundwater that has migrated past the waste boundaries; discharge of collected groundwater to a force main for eventual discharge to the sewage treatment plant; and long-term groundwater monitoring.	Construction/Capital: \$ 5,600,000 O&M: \$ 139,000 Present Worth: \$7,800,000
03/30/92	Kohler Landfill	Kohler	WI	Industrial Manufacturing Hazardous Liquid	VOCs PAHs Metals Inorganics PCBs	Waste material	The site overlies unconsolidated glacial and alluvial sediments underlain by fractured Niagaran Dolomite bedrock approximately 700 feet thick. Local weathering of the buried bedrock surface is evident but not prominent. Groundwater flow is toward the Sheboygan River, which surrounds the site in three directions. Regional groundwater flow in deep bedrock discharges into Lake Michigan. The primary source of drinking water in the area is Lake Michigan; however, bedrock in the site area is the only hydrostratigraphic unit that serves as a viable aquifer.	The selected remedy includes landfill closure; installation of a multilayer cap and perimeter leachate collection drain; leachate treatment prior to discharge to Sheboygan River; institutional operation, and surface controls; zoning and deed restrictions; and security control measures.	Construction/Capital: \$ 3,700,000 O&M: \$ 1,000,000 Present Worth: \$ 4,700,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/28/93	Lakeland Disposal Service, Inc.	Claypool	IN	Municipal Industrial Hazardous	Monocyclic Aromatic Hydrocarbons Chlorinated Aliphatic Hydrocarbons Ketones Tetrahydrofurans Carbon disulfide Benzoic Acid Phthalate esters Naphthalene Phenols Inorganics	Groundwater Waste material	The near surface geology of the site can be subdivided into two unconsolidated units. In the vicinity of Sloan Ditch and associated with the wetland is a silty sand loam and discontinuous lenses of silty and fine- to coarse-grained sand with occasional gravel seams. The second near-surface unit consists of silt and clay loam with some sand and gravel. Groundwater at the site is located in a shallow upper aquifer and lower gravel aquifer. The lower aquifer is confined and separated from the upper aquifer by a till unit.	The selected remedy includes construction of a landfill cap; construction of a soil-bentonite slurry wall and extraction wells to contain on-site groundwater in the upper aquifer; storage, treatment (if necessary), and discharge of recovered groundwater; removal of drummed wastes in the hot-spot area of the landfill; off-site treatment or disposal of drums and noncontainerized waste; installation of fencing; groundwater advisories, possible well abandonment, and deed restrictions; construction of an adjustable weir in Sloan Ditch (if necessary) to maintain proper water levels in the adjacent wetlands; excavation and off-site removal of landfill wastes and debris encountered during excavation for the slurry wall that exhibit RCRA hazardous waste characteristics; and wetlands assessment. Based on this assessment, if necessary, a program to mitigate, replace, or restore wetlands may be implemented.	Construction/Capital: \$ 7,798,600 O&M: \$ 174,000 Present Worth: \$ 10,473,300
01/13/94	Land and Gas Reclamation Landfill (Hechimovich Sanitary Landfill)	Williamstown	WI	Commercial Hazardous	NA	NA	This site overlies glacial till 50 to 100 feet thick. The glacial till overlies Ordovician-aged shale, sandstone, and dolomite bedrock. Bedrock immediately beneath the glacial till is believed to be Maquoketa Shale. Groundwater within the glacial till aquifer eventually discharges to the East Branch of the Rock River.	The selected remedy is no action. The reason for this determination is the court-ordered source control action implemented at this site has eliminated potential exposure to source-related contaminants except for those in groundwater. Groundwater contamination will be addressed during activities at the second operable unit.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/23/91	Lemberger Landfill, Inc.	Manitowoc County	WI	Municipal	PCE TCE Toluene Xylenes Organics PCBs Pesticides Arsenic Chromium Lead	Soil Sediment Debris Groundwater	The site overlies an upper granular unit, a cohesive unit, a lower granular unit, and bedrock. The upper aquifer is within the upper granular unit and is localized in the site area. The lower aquifer consists of well-graded, dense gravel and sand and is hydraulically connected with underlying bedrock. Bedrock is dolomitic limestone that is highly weathered and fractured near the surface.	The selected remedy includes institutional controls such as fencing and application of deed restrictions on future groundwater use; clearing and regrading of wastes to smooth out the existing cap; construction of a multilayer cap with a vegetative cover to minimize erosion; construction of a slurry wall and at least one small-volume groundwater extraction well in the upper aquifer; construction of an on-site groundwater treatment facility using electrochemical precipitation to remove inorganic contaminants and granular activated carbon to remove organic contaminants (unless treatability studies show that another technology is more effective); blending of extracted groundwater from near the slurry wall with extracted groundwater to be treated at the treatment facility; temporary on-site storage of residual sludge in 55-gallon drums; recycling of spent carbon, if possible; treatment and discharge of effluent to the Branch River; and provisions of an alternate water to supply to affected residents.	Construction/Capital: \$12,200,000 O&M: \$ 731,000 (yrs. 0-1) \$596,000 (yrs. 2-30) Present Worth: \$19,200,000
09/30/87	Marion (Bragg) Landfill	Marion	IN	Municipal Industrial	DCE Metals	Groundwater Soil	The site overlies sand and gravel outwash deposits underlain by 54 to 63 feet of low permeability glacial till. The unconsolidated deposits which are in turn underlain by limestone bedrock.	The selected remedy includes installation of a landfill cap; flood control measures; installation of fencing; provision of private drinking water wells within the deep aquifer for affected users; abandonment of existing shallow wells; and groundwater monitoring.	Construction/Capital: \$ 5,800,000 (for interim remedy) O&M: \$ 1,000,000 Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/28/88	Mason County Landfill	Mason County	MI	Municipal Industrial	Benzene PCE TCE Xylenes	Groundwater	The site overlies three or four subsurface tills. The upper three tills are relatively thin and are separated by thick outwash deposits. Mississippian-aged shale bedrock underlies the site at 650 feet bgs. The bedrock contains occasional interbeds of sandstone and limestone. Groundwater flow has not been described.	The selected remedy includes installation of a landfill cap; fencing around the site; application of deed restrictions on and near the site; and groundwater monitoring.	Construction/Capital: \$ Not stated O&M: \$ 1,000,000 (over 30 yrs) Present Worth: \$2,800,000
09/27/93	Mason County Landfill	Ludington	MI	Municipal	NA	NA	The site overlies three or four subsurface tills. The upper three tills are relatively thin and are separated by thick outwash deposits. Mississippian-aged shale bedrock underlies the site at 650 feet bgs. The bedrock contains occasional interbeds of sandstone and limestone. Groundwater flow has not been described.	The selected remedy is no further action.	No costs are stated as the remedy is no further action.
09/26/90	Master Disposal Service Landfill	Brookfield	WI	Industrial	Benzene Toluene Xylenes Metals Arsenic Chromium Lead	Soil Debris Groundwater	The site is underlain by reworked glacial drift and glacial till. The glacial deposits overlie the Niagara dolomite, which in turn overlies shale, sandstone, and dolomite.	The selected remedy includes installation of a clay and soil cap and an active venting system over the fill material to reduce infiltration into the waste mass; installation of a groundwater extraction system to remove organic and inorganic contamination; and monitoring of groundwater, surface water, water budget/hydrology, and wetlands.	Construction/Capital: \$ Not stated O&M: \$ 142,730 - \$164,130 Present Worth: \$4,632,000 - 5,016,000 (Includes O&M for 30 yrs.)
09/30/86	Metamora Landfill	Metamora	MI	Municipal Industrial Drums	Metals PCE TCE	Groundwater Soil	The site is underlain by unconsolidated deposits consisting of sand and gravel that is 250 to 300 feet thick in some locations and is also underlain by clay and till. The unconsolidated deposits overlie the Marshall Formation bedrock aquifer.	The selected remedy includes excavation of disposal areas one and four and disposal of all waste at an off-site RCRA-compliance incinerator.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$41,500,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/28/90	Metamora Landfill	Metamora	MI	Municipal Industrial Drums	Benzene PCE TCE Xylenes Arsenic	Debris Groundwater	The site is underlain by unconsolidated deposits consisting of sand and gravel that is 250 to 300 feet thick in some locations and is also underlain by clay and till. The unconsolidated deposits overlie the Marshall Formation bedrock aquifer.	The selected remedy includes groundwater treatment through groundwater extraction, precipitation, flocculation, air stripping, and reinjection of treated groundwater back into the shallow aquifer; and containment of landfill contents through construction of a landfill cap, collection of passive gas, and flaring.	Construction/Capital: \$ Not stated O&M: \$856,944 (20 yrs.) Present Worth: \$19,354,050
06/30/89	Midco II Site	Gary	IN	Industrial Drums Liquid	Benzene Toluene TCE Xylenes PCBs Arsenic Chromium Lead	Soil Sediment Groundwater	The site is level and underlain by sandy soil. Topography of the site and surrounding area has been modified by man. Topography to the north of the site includes ridge and swale. The site is underlain by two distinct aquifers. The uppermost aquifer is a 30-foot-thick surficial unconfined aquifer consisting of sandy surface deposits. Below this aquifer, a 110-foot-thick sequence of silty clay and silt loam till exists, which separates the surficial aquifer from the Silurian-aged bedrock aquifer.	The selected remedy includes institutional controls such as site access restrictions and deed restrictions; on-site solidification/ stabilization of contaminated soil, waste material, and sediments, followed by on-site consolidation of the solidified materials under the newly constructed cap; installation and operation of a groundwater extraction system; installation of a deep underground injection well; installation of a landfill cap; and related testing and long-term monitoring. If EPA disapproves the no-migration petition, contingencies include installation and operation of a groundwater treatment system followed by deep well reinjection of the salt-contaminated water; or installation and operation of a groundwater treatment system followed by reinjection of the salt-contaminated groundwater into the Calumet aquifer.	Construction/Capital: \$ Not stated O&M: \$ 733,000 (if groundwater is treated) \$301,000 (if groundwater is not treated) Present Worth: \$14,419,000 - \$18,596,400

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
06/30/89	Midco I Site	Gary	IN	Industrial	Benzene Toluene TCE PCBs PAHs Phenols Chromium Lead	Soil Sediment Groundwater	The site is level and underlain by sandy soil. Topography of the site and surrounding area has been modified by man. Topography to the north of the site includes ridge and swale. The site is underlain by two distinct aquifers. The uppermost aquifer is a 30-foot-thick surficial unconfined aquifer consisting of sandy surface deposits. Below this aquifer, a 110-foot-thick sequence of silty clay and silt loam till exists, which separates the surficial aquifer from the Silurian-aged bedrock aquifer.	The selected remedy includes surface removal and off-site disposal of wastes in drums and USTs; on-site treatment of contaminated soil and waste material by vapor extraction, solidification/ stabilization, and on-site deposition; on-site solidification/ stabilization of sediment; installation and operation of groundwater extraction system; installation of underground injection wells to reinject treated groundwater; installation of a landfill cap; and related testing and monitoring. If EPA disapproves the no-migration petition, contingencies include a contingency plan of the installation and operation of a groundwater treatment system, followed by deep well reinjection of salt-contaminated groundwater, or installation and operation of a groundwater treatment system followed by reinjection.	Construction/Capital: \$ Not stated O&M: \$ 525,000 (if groundwater is treated) \$188,000 (if groundwater is not treated) Present Worth: \$10,728,000 - \$13,989,000
09/30/88	Midstate Disposal Landfill	Marathon County	WI	Municipal Industrial	Metals PCE TCE	Groundwater Surface water Soil	The site overlies ground moraine till, saprolite (the weathered zone), and then metamorphic fractured bedrock. The till and saprolite layers are 0 to 23 and 2 to 7 feet thick, respectively. Fracturing within the bedrock extends to greater than 70 feet bgs. The bedrock surface slopes west in the western portion of the site and east in the eastern portion of the site. The bedrock becomes less fractured at about 10 feet below bedrock surface. Bedrock is weathered along zones of intense fracturing. Horizontal flow in the bedrock is partially controlled by two groundwater divides.	The selected remedy includes installation of a landfill soil and clay cap; provision of an alternate water supply to affected residents; groundwater, surface water, and landfill gas monitoring; off-site treatment of leachate; installation of fencing and signs to restrict site access; on-site road construction; and institutional controls to prevent on-site well installation.	Construction/Capital: \$ Not stated O&M: \$22,000 (yr. 1) \$100,000 (yrs. 2-30) Present Worth: \$16,000,000

SUMMARY OF ROD SELECTED REMEDIAL ACTIONS FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/91	Motor Wheel	Lansing	MI	Industrial	Benzene PCE TCE Toluene Xylenes Organics PAHs PCBs Pesticides Arsenic Chromium Lead	Soil Debris Groundwater	The site overlies glacial till and a glacial aquifer. The glacial deposits rest unconformably on Pennsylvanian-aged sediments of the Grand River and Saginaw Formation. The Grand River Formation is not present beneath the site; however, the Saginaw Formation does underlie the site and consists of alternating stream channel sands, river flood plain silts and clays, shallow water marine or tidal swamp shales and limestones and coal seams. The Saginaw Formation is estimated to be about 450 feet thick in the site area. An upper till unit underlies most of the site south and west of the excavated area. Mason Esker sand and gravel underlies till or lacustrine clay beneath the entire site except in the excavated area. Two distinct water-bearing zones underlie the site: a perched zone aquifer and an unconfined aquifer in the Mason Esker sediments.	The selected remedy includes installation of a Michigan Act 64 landfill cap; backfilling to cover exposed fill areas; extraction and on-site treatment of contaminated groundwater using air stripping, granular activated carbon, and alumina reaction; treatment of off-gas; application of site deed restrictions; groundwater monitoring; and installation of a slurry wall.	Construction/Capital: \$ 11,083,300 O&M: \$ 1,277,400 (for 30 yrs.) Present Worth: \$30,720,300
06/12/92	Muskego Sanitary Landfill	Muskego	WI	Municipal Oils Paint	VOCs PAHs PCBs Pesticides Phenols Phthalate	Groundwater Soil	The site overlies an area of thick glacial drift 50 to 300 feet thick. Glacial deposits in the area are underlain by Silurian-aged Niagara Dolomite that is sequentially underlain by Maquoketo Shale, dolomite, sandstones, and igneous and metamorphic rocks. Groundwater flow and water table elevation within the glacial drift varies because of the complex nature of the geological features. The upper glacial drift aquifer is one of the principal sources of residential groundwater in Waukesha County.	The selected remedy includes cap installation over a portion of the site; deed restrictions and site controls to prevent access, excavation, and disturbance of the landfill cap and wells; extension of the existing fence; installation or upgrade of existing on-site landfill leachate control systems; in situ soil vapor extraction in portions of the site; and groundwater monitoring of selected monitoring and private wells.	Construction/Capital: \$ 8,000,000 O&M: \$ 1,900,000 - 2,800,000 Present Worth: \$9,900,000 - \$10,800,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
02/02/95	Muskego Sanitary Landfill	Muskego	WI	Municipal Oils Paint	VOCs PAHs PCBs Pesticides Phenols Phthalate	Groundwater	The site overlies an area of thick glacial drift 50 to 300 feet thick. Glacial deposits in the area are underlain by Silurian-aged Niagara Dolomite that is sequentially underlain by Maquoketo Shale, dolomite, sandstones, and igneous and metamorphic rocks. Groundwater flow and water table elevation within the glacial drift varies because of the complex nature of the geological features. The upper glacial drift aquifer is one of the principal sources of residential groundwater in Waukesha County.	The selected remedy includes groundwater monitoring throughout the site; groundwater pumping test(s); installation and operation of groundwater extraction wells near the noncontiguous fill area; on-site treatment and discharge of extracted groundwater from the noncontiguous fill area; discharge of treated water to an on-site infiltration basin; and disposal of treatment residuals (if generated) to an off-site disposal facility. In addition, the remedy includes continued monitoring and evaluation of the effectiveness of the extraction system and expansion of the system, if necessary.	Construction/Capital: \$ 1,200,000 O&M: \$ 6,200,000 Present Worth: \$7,400,000
09/27/85	New Lyme Landfill	New Lyme	OH	Municipal Commercial Industrial Institutional Construction and demolition debris	Asbestos Laboratory chemicals Oils Resins and resin tar Sludge Solvents Toluene VOCs	Groundwater Sediment Soil	The site overlies glacial till consisting of clayey silt to silty clay to sandy clay and contains pebbles. The till layer appears to be an aquitard, thus groundwater flows primarily along fractures in the till. The glacial till overlies bedrock consisting of the Ohio Shale Formation. This formation consists of gray siliceous shale. Bedrock surface is weathered and fractured. Artesian conditions are present across the site.	The selected remedy includes construction of a RCRA landfill cap; installation of groundwater extraction wells; on-site treatment of groundwater and leachate using biological disc sodium hydroxide precipitation, and granular activated carbon until leachate is no longer produced; on-site consolidation of sediment under landfill cap; gas control; installation of fencing; and groundwater monitoring.	Construction/Capital: \$ 10,798,000 O&M: \$52,000 (For the duration that water treatment is necessary then O&M decreases to \$44,000 annually) Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
03/30/90	NL Industries - Taracorp Lead Smelt Site	Granite City	IL	Inactive secondary lead smelting facility	Metals Lead	Soil Debris	The site is underlain by recent alluvium, and glaciofluvial and glaciolacustrine deposits. Bedrock beneath the alluvium consists of caroniferous age rocks, primarily limestone, sandstone, and shale. Groundwater flow is south-southwest across the site toward the Mississippi River.	The selected remedy includes removal of crushed rubber battery casings and lead-contaminated soil from residential areas; consolidation of soil, crushed casings, and lead-contaminated materials in a slag pile; installation of a RCRA-compliant, multimedia cap over the pile; installation of fencing and wells; groundwater and air monitoring; inspection and maintenance of the cap; removal and recovery of drums from the pile; consolidation of the waste from another lead recycler; excavation and consolidation of battery casings and contaminated soil from nearby communities; installation of dust controls, and development of contingency plans to remediate high concentrations of lead in groundwater and air.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated
12/21/90	Oak Grove Sanitary Landfill	Anoka County	MN	Municipal Industrial	VOCs Benzene Toluene Xylenes Metals Arsenic	Groundwater	The site overlies 250 feet of unconsolidated deposits that include two aquifers separated by a semi-confining layer. The first aquifer is a shallow sand aquifer ranging from about 13 to 54 feet thick. This aquifer is overlain by a peat deposit and underlain by glacial till of 40 to 80 feet thick. The second aquifer consists of a sand and gravel formation below the till.	The selected remedy includes long-term groundwater monitoring of both site aquifers; long-term monitoring of surface water and sediments; institutional controls on the placement of drinking water wells; and natural attenuation of shallow contaminated groundwater.	Construction/Capital: \$ Not stated O&M: \$ 90,000 (yr. 1) \$70,000 (after yr 1) Present Worth: \$800,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/88	Oak Grove Landfill	Anoka County	MN	Municipal Industrial	VOCs Ethyl benzene Toluene Xylenes	Groundwater Surface water	The site overlies a broad sand plain formed from glacial drainage. Two shallow groundwater units are located beneath the landfill. A till deposit is present between them and may function as an aquitard.	The selected remedy includes installation of a landfill cap with a final cover system consisting of a gas control layer, a barrier layer or a flexible membrane and a drainage layer; installation of topsoil cover and vegetation; application of site deed restrictions; and use of gas vents to be considered for air emissions after construction of the final cover.	Construction/Capital: \$ Not stated O&M: \$ 42,000 (if clay barrier) \$40,000 (if synthetic barrier) Present Worth: \$6,300,000 - \$11,100,000 (If clay barrier is used) \$5,500,000 - \$9,300,000 (If synthetic barrier is used)
03/31/92	Old City Landfill	Columbus	IN	Municipal Industrial	NA	NA	The site overlies complex heterogeneous deposits of unconsolidated recent and Pleistocene-aged materials, including several layers of glacial till that extent to shale bedrock. Groundwater is present beneath the site within the shallow unconsolidated aquifer.	The selected remedy is modified no action. A minimum of 2 additional groundwater wells are to be installed and groundwater monitoring is to continue for a minimum of five years. At the end of the initial 5 year period an evaluation of the protectiveness of the selected remedy is to be conducted.	No costs stated because remedy is no action.
06/08/94	Olmsted County Sanitary Landfill Site	Olmsted County	MN	Municipal Commercial Industrial	NA	NA	The site overlies a thin layer of topsoil that in turn overlies soluble limestone, sandstone, and dolomite bedrock. Occasional deposits of windblown loess, stream alluvium, or glacial till also overlie the fractured bedrock. Groundwater is present in substantial quantities in the limestone and deeper sandstone layers in the area.	The selected remedy is no action.	No costs stated because remedy is no action.

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
06/28/91	Pagel's Pit	Winnebago County	IL	Municipal	VOCs 1,2-Dichloroethene Vinyl chloride Metals Arsenic Barium Thallium Zinc	Groundwater	The site is located on a topographic high between Killback Creek to the west and unnamed intermittent streams to the north and south. Topography surrounding the site is relatively flat to gently rolling. The site overlies glacial drift which in turn overlies dolomite bedrock that is generally fractured. The fracture intensity is variable throughout the site.	The selected remedy includes installation of a sanitary landfill cover; groundwater extraction; on-site groundwater treatment by carbon adsorption or air stripping followed by pretreatment with a solids filter before discharge to surface water; leachate extraction; gas extraction; deed restrictions; and site monitoring.	Construction/Capital: \$ Not stated O&M: \$ 310,000 or \$248,000 (Depending on the remedy) Present Worth: \$9,800,000 or \$11,000,000
09/30/91	Pine Bend Sanitary Landfill	Inver Grove Heights	MN	Municipal Demolition wastes	VOCs Benzene PCE TCE Toluene	Groundwater	The site overlies glacial drift which in turn overlies about 700 feet of Cambrian bedrock. Bedrock surface is eroded in some places.	The selected remedy includes installation of a permanent alternate water supply connecting impacted or potentially impacted premises to the municipal water supply wells; and sealing the potentially affected on-site private water supply wells.	Construction/Capital: \$ Not stated O&M: \$ 30,350 Present Worth: \$2,649,499
09/30/93	Powell Road Landfill	Montgomery County	OH	Commercial Industrial Municipal	VOCs	Landfill gas Groundwater Leachate Soil	The site overlies outwash deposits, glacial till, lacustrine deposits, and bedrock. The outwash deposits constitute the regional aquifer known as the Great Miami River Buried Valley Aquifer, which is the main source of water in the Dayton metropolitan area. Residents near the site obtain water from private wells screened in this aquifer.	The selected remedy includes institutional controls including fencing, deed restrictions, and posting of warning signs; improvement of the landfill cap with a liner; excavation of contaminated soil; consolidation of excavated soil under the landfill cap; groundwater monitoring; flood protection and storm water controls; active landfill gas collection; leachate collection and on-site treatment; groundwater extraction from the shallow aquifer adjacent to the landfill and on-site treatment; and discharge of treated leachate and groundwater to the Great Miami River.	Construction/Capital: \$ 20,466,000 O&M: \$ 44,000 Present Worth: \$20,510,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
06/28/95	Refuse Hideaway Landfill	Middleton	WI	Municipal Commercial Industrial	VOCs	Groundwater	The site overlies unconsolidated glacial deposits consisting of till, outwash, and glacial lake sediments that often reach thicknesses of several hundred feet. Bedrock beneath the glacial deposits consists of Ordovician-aged Prairie du Chien dolomite, which caps bluffs in the region but is absent in the valleys. Bedrock fracturing is visible in the outcrops. Groundwater flow direction is varied in the site area. Immediately surrounding the landfill, a localized radial component of groundwater flow is apparent resulting from groundwater mounding beneath the landfill.	The selected remedy includes institutional controls including deed restrictions, zoning restrictions, and posting of warning signs; maintenance of the existing soil cap and gas and leachate collection system; continued groundwater and private home well monitoring for VOCs; and installation of four groundwater extraction wells, treatment of the extracted water, and reinjection it into the aquifer. If the area of contamination moves and additional homes become imminently threatened by contamination, point-of-entry treatment systems will to be installed.	Construction/Capital: \$ 803,000 O&M: \$ 319,500 Present Worth: \$5,200,000
03/27/96	Ripon City Landfill	Ripon	WI	Industrial	VOCs	Source control Groundwater	The site overlies 180 feet of unconsolidated glacial deposits. The glacial deposits consist primarily of sand with some silty clayey lenses and gravel. Bedrock beneath the glacial deposits is a Cambrian-aged sandstone unit approximately 150 feet thick. The glacial deposits and sandstone bedrock are the two principal aquifers in the area. Municipal wells and many private wells are screened in the sandstone aquifer.	The selected remedy for source control includes construction and maintenance of a composite landfill cover over the entire landfill and installation of passive landfill gas venting system as part of the cap; monitoring of groundwater wells and landfill gas probes; installation of fencing; and a deed restriction prohibiting disturbance of the cap except for maintenance purposes. The selected remedy for groundwater is no action.	Construction/Capital: \$ 1,220,000 O&M: \$ 34,000 Present Worth: \$1,688,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/27/93	Sanitary Landfill Company (also known as Cardington Road Landfill)	Moraine	OH	Municipal	Organic gases	Landfill gases	The site overlies a kame terrace in the Great Miami River Buried Valley Aquifer system. Glacial materials deposited in the buried valley system are the primary source of groundwater in the site area and range from 100 to 300 feet thick.	The selected remedy includes institutional controls to limit access and future use, and expand fencing; install a landfill cap; install on site subsurface gas controls and surface run-off controls; and a Supplemental Site Investigation that will involve installation of two additional monitoring wells. During the Remedial Design and Remedial Action, natural attenuation of contaminated groundwater and groundwater extraction and treatment will be further evaluated and, if necessary, included as part of the remedy.	Construction/Capital: \$ 6,019,400 O&M: \$ 2,125,900 Present Worth: \$8,145,300
09/28/95	Sauk County Landfill	Excelsior	WI	Municipal Industrial (including foundry sand)	NA	NA	The site overlies approximately 50 feet of unconsolidated material consisting primarily of sand with some silt and gravel layers. Underlying the unconsolidated material are three bedrock units. The top bedrock unit is a poorly lithified, weathered sandstone. The middle bedrock unit is the Lone Rock Formation consisting of siltstone, shale, and very fine-grained sandstone. The lowest bedrock unit is the Wonewoc Formation consisting of medium-grained sandstone. The Wonewoc Formation aquifer supplies water for some residences located near the site.	The selected remedy is no action. VOC concentrations have dropped dramatically since monitoring began in the mid-1980's. Monitoring will continue on a semiannual basis, and action will be taken if concentration levels increase.	Construction/Capital: \$ Not stated O&M: \$ 25,000 Present Worth: \$344,000
06/04/93	Skinner Landfill	West Chester	OH	Demolition debris Municipal Chemical Liquid (including paint, ink, creosote and pesticides)	VOCs SVOCs DNAPLs Inorganics PCBs PAHs Dioxins Furans	Groundwater Soil	The site overlies unconsolidated glacial sediments that vary from clay-rich to gravel-rich deposits. These deposits are up to 40 feet thick. Groundwater beneath the site is located in the glacial drift and fractured bedrock aquifers. Nearby wells use the bedrock aquifer as a source of drinking water supply.	The selected remedy includes institutional controls to limit future site use; construction of a multilayer cap over waste materials; interception, collection, and treatment of contaminated groundwater; diversion of upgradient groundwater flow; soil vapor extraction; and groundwater and surface water monitoring.	Construction/Capital: \$ 9,700,900 O&M: \$ 397,000 Present Worth: \$16,031,900

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/92	Skinner Landfill	West Chester	OH	Demolition debris Municipal Chemical Liquid (including paint, ink, creosote and pesticides)	VOCs SVOCs Inorganics PCBs PAHs Dioxins Furans	Groundwater Soil	The site overlies unconsolidated glacial sediments that vary from clay-rich to gravel-rich deposits. These deposits are up to 40 feet thick. Groundwater beneath the site is located in the glacial drift and fractured bedrock aquifers. Nearby wells use the bedrock aquifer as a source of drinking water supply.	The selected remedy includes installation of fencing and warning signs; groundwater monitoring; and supplying an alternative water supply to those potentially impacted by migration of contaminated groundwater from the site.	Construction/Capital: \$ 160,000 O&M: \$ 30,000 Present Worth: \$
09/28/95	Southside Sanitary Landfill	Indianapolis	IN	Municipal Industrial Agricultural	NA	NA	The site overlies a thin silty clay layer, a sand and gravel aquifer 5 to 37 feet thick, and Black New Albany shale bedrock. The landfill has apparently not impacted groundwater quality.	The selected remedy is no action.	No costs are stated because the remedy is no action.
06/30/92	Spickler Landfill	Spencer	WI	Municipal Industrial	VOCs Pesticides Metals Inorganics Asbestos	Soil Sludge	The site overlies unconsolidated deposits consisting of clays, sands, and gravel. Bedrock consists of Upper Cambrian-aged sandstone, probably the Mount Simon Formation. The upper bedrock surface contains well-developed fractures and joints. A wetland exists which may act as a groundwater recharge or discharge area.	The selected remedy includes institutional controls, fencing, and deed restrictions to restrict future use; solidification/stabilization of the contents of the mercury brine pit, followed by installation and maintenance of an impermeable cap; installation and maintenance of a solid waste cap over old and new fill areas except the brine pit; installation and maintenance of a leachate extraction and treatment system in the landfills except the mercury brine pit; installation and maintenance of an active landfill gas collection system; monitoring of groundwater, leachate and landfill gas; and inspection of fencing and landfill cap.	Construction/Capital: \$ 3,833,000 O&M: \$ 113,000 Present Worth: \$4,859,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/30/91	Stoughton City Landfill	Stoughton	WI	Municipal Industrial	Benzene Tetrahydrofurans Toluene Xylenes Other organics PAHs Metals Arsenic Chromium Lead	Soil Debris Groundwater	The site overlies surficial deposits including ice-contact stratified deposits and lacustrine plain sediments. These deposits are underlain by glacial outwash which overlies Cambrian-aged sandstone bedrock.	The selected remedy includes the placement of a solid waste disposal cap over the site; excavation of wastes in contact with groundwater and consolidation under the cap; pumping and treatment of contaminated groundwater, if required; long-term groundwater monitoring; and implementation of institutional controls and site security measures such as fencing entire perimeter of site.	Construction/Capital: \$ Not stated O&M: \$ 329,600 (yrs. 0-5) \$146,600 (yrs. 6-30) Present Worth: \$7,546,000
06/30/88	Summit National Liquid Disposal Services	Deerfield	OH	Solvent recycling and waste disposal	Metals Arsenic Chromium Organics PAHs PCBs Phenols VOCs Benzene TCE Toluene Xylene	Groundwater Surface water Soil Sediment	The hydrogeology of the site is complex because of three distinct hydrogeological units: the water table aquifer, the "intermediate units," and the upper Sharon "aquifer." Groundwater flow in the water table is to the southeast. The intermediate unit is divided into two strata by unnamed limestone; the upper portion flows southeastward and the lower portion flows westward. Groundwater in the upper Sharon flows northward. Vertical gradients within bedrock vary across the site.	The selected remedy includes access and deed restrictions; groundwater and surface water monitoring; removal of structures and debris; excavation and incineration of hot spot soils, sediments, drum and tank contents; installation of a multilayer cap over the entire site; installation of a slurry wall; installation of extraction wells and on-site treatment system; removal and treatment of surface water; rerouting of ditches; regrading and revegetating; and relocation of a residence.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated
09/30/92	Tri County Landfill	Kane, Cook, and DuPage Counties	IL	Industrial Liquid Commercial Incinerator ash	VOCs PAHs PCBs Pesticides Metals	Soil Sediment Debris Groundwater Surface water Air	The site overlies a shallow groundwater zone, an intermediate groundwater zone, and a deep bedrock aquifer. All three groundwater zones are hydraulically connected. The deep aquifer is located in the first bedrock unit encountered beneath the site. Local municipalities, residences, and businesses rely on wells screened in the bedrock aquifer as a source of drinking water.	The selected remedy includes institutional controls such as fencing and land-use restrictions; excavation of contaminated sediment and consolidation in the landfill; construction of a landfill cap; collection, treatment, and disposal of contaminated groundwater; active collection and treatment of landfill gases; and a comprehensive monitoring program.	Construction/Capital: \$ 8,634,000 O&M: \$ 234,500 Present Worth: \$12,624,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
03/31/92	Twin Cities Air Force Reserve (Small Arms Range Landfill)	Minneapolis	MN	Industrial (including paints and leaded aviation gasoline sludge)	VOCs Organics Metals	Groundwater	The site overlies an upper aquifer consisting of a gravelly sand layer underlain by heterogeneous, unconsolidated, low permeability, silty sand, peat, clay, silty sandy clay, and sandy clay. The low permeability materials form a confining strata which separates it from the lower aquifer. An unconformable contact is interpreted between the St. Peter Sandstone (bedrock) and the overlying deposits. Artesian conditions may exist in the lower aquifer.	The selected remedy includes deed restrictions when ownership of the property is not the federal government; installation of a fence to restrict access; natural attenuation of low-level groundwater contaminants; and groundwater and surface water monitoring to assess baseline conditions and determine future sampling activities, if necessary.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ Not stated

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
03/31/94	Van Dale Junkyard	Washington County	OH	Industrial (including automobiles, tires, and batteries) Drums	VOCs Organics Inorganics Metals	Soil Sediment Groundwater Surface water	Surface soil at the site consists of thin silty clay which is underlain by thick subsoil consisting of clay and silt to depths up to 20 feet bgs. The bedrock is exposed in some areas and is primarily composed of alternating beds of calcareous red claystones, siltstones, sandstones, and shales, with some thin beds of coal and limestone. Bedrock is highly fractured, and groundwater flow is controlled primarily by the fractures. Because the fractures are not uniform in the site area, groundwater is probably located at various depths and quantities in nearly all bedrock strata. Groundwater flows horizontally along bedding planes and horizontal breaks. Groundwater flows vertically through the fractures.	The selected remedy includes institutional controls to prevent installation of drinking water wells and fencing to restrict site access; collection of about 9,000 cubic yards of soil and 8,900 cubic yards of solid waste (including drums) containing organic and inorganic contaminants; segregation of solid wastes (including drummed wastes) from soil; off-site disposal of drummed materials, sludge, and other wastes, especially hazardous wastes; screening of solid waste for materials that can be decontaminated on site and salvaged off site; on-site consolidation of soil and remaining solid wastes in contaminated soil areas, followed by construction of a hazardous waste landfill cap; bioremediation of organic contaminants in seep sediments; and groundwater, surface water, and sediment monitoring. Because groundwater distribution and availability varies greatly due in the site area, natural attenuation will be used for groundwater restoration instead of treatment. If expeditious cleanup does not occur, contingent measures will be considered, including additional source removal, active groundwater remediation, and engineering controls.	Construction/Capital: \$ 3,709,650 O&M: \$ 855,230 Present Worth: \$4,564,880

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
11/15/90	Washington County Landfill	Lake Elmo	MN	Sanitary	VOCs Benzene PCE	Groundwater	The site is underlain by sand and gravel deposits which constitute an unconfined aquifer. St. Peter sandstone and Prairie Du Chien dolomite aquifers underlie the glacio-fluvial aquifer. The site overlies two separate aquifers in the unconsolidated materials above bedrock. The upper aquifer, 80 to 160 feet, consists of sand and gravel outwash deposit. Below the outwash is a dense clayey to silty till layer about 70 feet thick. Below the till layer lies a lower aquifer of dolomite and sandstones.	The selected remedy includes a final remedy for drinking supplies, a municipal drinking water supply system to supply 10 homes with contaminated private wells, and continuing operation of gradient control wells and spray irrigation treatment for the first operable unit, which consists of four gradient control wells, two on-site spray-irrigation treatment areas, and on-site discharge to surface water.	Construction/Capital: \$ Not stated O&M: \$ 2,469 Present Worth: \$400,000
03/31/89	Wauconda Sand & Gravel	Wauconda	IL	Residential Construction Industrial	Vinyl chloride Benzene Metals Arsenic Lead Methane	Groundwater Surface water Air	The site is underlain by five stratigraphic units including (1) a surficial clayey silt unit, (2) an upper sand unit (aquifer), (3) a clay unit (aquitard), (4) a lower sand unit (lower aquifer), and (5) a dolomite bedrock unit. Surface topography at the site is composed of low ridges and hills interspersed with lakes and peat bogs in low elevation areas.	The amended ROD indicates the following selected remedies: monitoring groundwater and Mutton Creek; monitoring downgradient contaminant plume; air emission controls, possible with active collection system with ground flare or other treatment; restrictions of on-site groundwater use; improvement of site cover; and long-term maintenance and inspections.	Construction/Capital: \$ Not stated O&M: \$ 174,500 Present Worth: \$12,155,606
09/30/85	Wauconda Sand Gravel	Wauconda	IL	Residential Construction Industrial	Inorganics Metals Organics PCBs	Groundwater Soil Surface water	The site is underlain by five stratigraphic units including (1) a surficial clayey silt unit, (2) an upper sand unit (aquifer), (3) a clay unit (aquitard), (4) a lower sand unit (lower aquifer), and (5) a dolomite bedrock unit. Surface topography at the site is composed of low ridges and hills interspersed with lakes and peat bogs in low elevation areas.	The selected remedy includes installation of leachate collection drains; disposal of leachate at sewer plant or hazardous waste treatment facility; regrade existing soil cover; revegetation of bare and eroded areas; and construction of perimeter fencing.	Construction/Capital: \$ Not stated O&M: \$ 50,000 Present Worth: \$1,600,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
03/30/90	Wayne Waste Oil	Columbia City	IN	Oil reclamation Municipal	Benzene PCE TCE Toluene Xylenes PAHs Phenols Metals Arsenic Chromium Lead	Debris Groundwater	The site overlies glacial outwash deposits consisting of alternating layers of sand, silt, and silty clay. The glacial deposits in turn overlie shale and dolomite bedrock.	The selected remedy includes installation of security fencing; application of deed restrictions; construction, operation, and maintenance of a SVE system; remediation of lead-contaminated soil by soil washing or immobilization/stabilization; groundwater and air monitoring; groundwater extraction and treatment of discharge system; delineation of the extent of municipal landfill; installation of RCRA Subtitle D landfill cap; placement of PAH-contaminated soil under landfill cap; removal and treatment of all on-site tank contents; and removal and disposal of site debris, including tanks, trucks, etc.	Construction/Capital: \$ Not stated O&M: \$ 291,000 (for 15 yrs.) Present Worth: \$5,582,499
06/30/93	Woodstock Municipal Landfill	Woodstock	IL	Municipal Industrial (including paints, plating wastes, and solvents) Drums (including PCBs) Liquids	VOCs SVOCs Metals	Soil Sediment Groundwater Leachate Landfill gas	The site overlies a complex sequence of unconsolidated glacial deposits approximately 200 feet thick. These deposits consist of an upper sand and gravel aquifer, an intermediate clay till member, a lower clay till member, and a lower sand unit. Bedrock is composed of dolomite and shale. Glacial deposits and bedrock aquifers underlying the site contain groundwater currently being used or with the potential for use as a drinking water source. Surface water runoff discharges to a wetland area and subsequently to the Kishwaukee River.	The selected remedy includes institutional controls to limit land and groundwater use; excavation of contaminated sediment and sludge and consolidation under the landfill cap; construction of a geosynthetic landfill cap; installation and maintenance of a landfill gas venting system; installation and operation of a groundwater extraction, treatment, and discharge system; development and implementation of a comprehensive monitoring program; mitigation of wetland damage or loss; and development and implementation of a surface water and sedimentation control system.	Construction/Capital: \$ 7,054,000 O&M: \$ 129,000 Present Worth: \$8,681,000

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

ROD Date	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
12/96	Yeoman Creek Landfill	Waukegan	IL	Municipal Industrial Commercial	PCBs	Soil Sediment Leachate Landfill gas Groundwater Surface water Wetlands	The site area is geologically complex and variable, however, continuous lower outwash unit is located beneath the site area. Bedrock units are isolated from the three overlying unconsolidated aquifers by more than 30 feet of till. The three aquifers are a shallow upper outwash unit, a fluviolacustrine unit, and a lower outwash unit. There is little hydraulic communication between the shallow aquifer and the fluviolacustrine unit. The fluviolacustrine unit is connected to the lower outwash unit. Groundwater is not used in the site area.	The selected remedy includes institutional controls to limit access and future use of the site; construction of a new landfill cover consisting of a geosynthetic drainage layer overlain by protective geonet and two barrier layers; construction and operation of an active perimeter landfill gas collection and treatment system; excavation of contaminated sediment and consolidation under the new landfill cover; actions to minimize destruction, loss, or degradation of wetlands; flood plains planning; construction of a corrugated steel semiarch pipe to enclose Yeoman Creek; rerouting and sealing of storm drains; and long-term monitoring and maintenance.	Construction/Capital: \$ 20,100,000 O&M: \$ 450,000 Present Worth: \$26,300,000

((

SUMMARY OF ROD SELECTED REMEDIES FOR EPA REGION 5 LANDFILLS

Notes:

AST	Aboveground storage tank
bgs	Below ground surface
DCE	Dichloroethene
DNAPL	Dense nonaqueous-phase liquid
EP	Extraction procedure
EPA	U.S. Environmental Protection Agency
mg/kg	Milligram per kilogram
NA	Not applicable; no action remedy selected, therefore no major contaminants or areas of concern
NPDES	National Pollutant Discharge Elimination System
PAH	Polynuclear aromatic hydrocarbon
PBB	Polybrominated biphenyl
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
ppm	Part per million
RCRA	Resource Conservation and Recovery Act
ROD	Record of decision
SVOC	Semivolatile organic compound
TCA	Trichloroethane
TCE	Trichloroethene
UST	Underground storage tank
VOC	Volatile organic compound

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
REGION 4									
06/30/94 (RODs Database)	Caldwell Lace Leather	Auburn	KY	Industrial	Tanning sludge (including chromium and asbestos)	Soil Groundwater Surface water Leachate	The site overlies soil deposits from 0 to 43 feet in depth. The soil deposits are underlain by limestones, shales, and sandstone of the Mississippian-age including, in descending order, (1) the Big Clifty Sandstone member of the Golconda Formation, (2) the Girkin Formation, and (3) the Ste. Genevieve Limestone. The Girkin Formation, approximately 170 feet thick, underlies the highly developed karst terrain lowlands that surround the site. Discontinuous shale and sandstone units up to 5 feet thick are present about 45 feet above the base of the Girkin Formation. The Ste. Genevieve Formation underlies the Girkin Formation. The Ste. Genevieve Formation, approximately 200 feet thick near the site, is basal limestone. Groundwater discharge is governed by the karst development of the Girkin Formation, which discharges to a municipal water supply.	EPA recommends that no Superfund action be taken, however EPA recommends owner continues groundwater/spring monitoring and that future land use restrictions be placed on the property as well as maintenance of the landfill cover to prevent land use activities that would expose subsurface waste.	No costs are stated because it is a no action remedy.

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
11/02/93 (RODs Database)	Cedartown Municipal Landfill	Cedartown	GA	Municipal Hazardous Industrial	VOCs Metals	Groundwater Leachate	The site overlies Ordovician-aged Newala Limestone. The primary post-depositional feature of the Newala Limestone is the presence of karst features, which range from small voids to large cavern-like openings. Rock was encountered at elevations ranging from approximately 700 to 785 feet. Groundwater discharges to a pond, which is located approximately 500 feet from the central portion of the landfill perimeter. The contaminated groundwater under the site does not affect the public drinking water supply.	The selected remedy includes implementation of institutional controls such as record notices and deed, zoning, and land-use restrictions; cover maintenance and seep controls; groundwater and surface water monitoring; performance of a two-year review during which EPA would determine whether groundwater performance standards continue to be appropriate and if natural attenuation processes are effective; implementation of a contingency remedial action, which includes groundwater extraction, on-site treatment, and discharge under NPDES to a nearby surface water or POTW; continuation of groundwater monitoring upon attainment of the performance standards until EPA approves a five-year review.	<p>O&M: \$ Not stated</p> <p>Present Worth: \$ 459,000 to 723,000 (including 30 years of O&M)</p> <p>Contingency Remedy: Construction/Capital: \$ 1,394,500 and 3,830,500 (for 30 years O&M for 50 gpm) to 1,539,000 and 7,092,000 (for 30 years O&M for 100 gpm treatment system)</p> <p>O&M: \$ Not stated</p> <p>Present Worth: \$ 5,222,000 to 8,631,000</p>

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
05/03/94 (RODs Database)	Diamond Shamrock Landfill	Cedartown	GA	Hazardous Commercial Drums (chemical wastes)	NA	Groundwater	The site overlies residual soils 8 to 14 feet thick. Residual soils derived from the in-place weathering of Newala Limestone consist of silty-clays, or clays with variable amounts of sand and silt. Soils are underlain by the Newala Limestone Formation, which is part of the Knox Group. The Knox Group, including the Newala Limestone, is prone to karst solutioning. Many of the small lakes and ponds in the site area are expressions of sink hole features. Based on the morphology of the sink holes, bedding-controlled karstic solutioning may be more active than joint-controlled solutioning. Solution features are controlled by the distribution of joints or open fractures. The degree of solutioning within the limestone is likely to increase toward Cedar Creek, which is a potential swimming site, but is not used as a local drinking water supply.	The remedy selected includes implementation of institutional controls such as deed restrictions or restrictive covenants to prevent groundwater usage and drilling resulting in exposure to groundwater contaminants and access restrictions including fencing and signage; groundwater and surface water monitoring; performance of five-year reviews; and continuation of groundwater monitoring upon attainment of performance standards.	Construction/Capital: \$ 30,360 O&M: \$ 34,730 (for 30 years) Present Worth: \$ 461,331 (semi-annual sampling)

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/28/90 (RODs Database)	Howe Valley Landfill	Howe Valley	KY	Commercial	VOCs (such as PCE) Metals (including Chromium)	Soil Groundwater Surface water	The site overlies well-drained soils and outcrops on hilly karst uplands. The underlying strata of the site are part of the Mississippian plateau; a very large belt of alternating beds of sandstone, shale, and soluble carbonates. The presence of a groundwater divide creates a natural barrier preventing the possibility of groundwater contaminating the public drinking water supply. The site is located within a closed basin; therefore no off-site sinkholes receive surface run-off from the site.	The remedy selected includes implementation of institutional controls such as deed restrictions; excavation of approximately 100 cubic yards of soil from outlying areas that contain elevated inorganic levels, followed by off-site disposal; excavation and treatment (through on-site aeration) of approximately 7,400 cubic yards of soils with elevated concentrations of organics, followed by aeration; performance of a treatability study; on-site disposal of treated soil; on-site air monitoring; installation of water diversion ditches; installation of vegetative cover over entire site; groundwater monitoring at Boutwell Spring and at additional springs or wells. If treatability study indicates that soil aeration will not effectively reduce contamination, proposed contingency remedy would include excavation, stockpiling, and transportation of approximately 7,500 cubic yards of contaminated soil to an off-site RCRA-approved landfill for disposal.	Primary Remedy: O&M: \$ 46,625 (for five years) Present Worth: \$ 394,524 (includes O&M) Contingency Remedy: O&M: \$ 46,625 (for five years) Present Worth: \$ 3,852,000 (includes O&M)
09/19/90 (RODs Database)	Lewisburg Dump	Lewisburg	TN	Municipal Industrial	Bis(2-ethylhexyl)phthalate Aluminum Barium Copper Zinc Manganese	Soil Groundwater Surface water Sediment	The site overlies rock units that are part of the Ordovician Stone River Group (approximately 600 to 700 feet thick). Rock units include Ridley Limestone, Pierce Limestone, and Murfreesboro Limestone. The Ridley Formation is a hydraulically complex karst aquifer with the most amount of groundwater discharging into Big Rock Creek. The Ridley aquifer is used for drinking water, but alternate sources are readily available and the groundwater is not ecologically vital.	The remedy includes implementation of institutional controls such as deed restrictions and access restrictions including installation of a security fence; removal of the submerged pond debris; removal of site surface debris; replacement of plastic test-pit caps with clay and soil; and regrading of the landfill cap; and implementation of a five-year well monitoring and analysis program.	O&M: \$ 270,042 (for years 0 to 5) Present Worth: \$ 791,512 to 1,189,741 (includes O&M costs; cost is dependent on options implemented)

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
09/28/92 (RODs Database)	Madison County Sanitary Landfill	Madison County	FL	Municipal Construction Industrial	VOCs	Soil Groundwater	The site overlies two lithologic units (1) alternating layers of pure sands, clays, and lenses of silty sandy limestone 5 to 50 feet thick, and (2) a bluish to greenish grey, highly plastic, fat clay, which is comprised of very little sand or silt. The fat clay unit, 6 to 60 feet thick, tends to conform to the topography of the underlying Suwannee Limestone, making an effective seal, in most places, against downward movement of contaminants into the Floridan aquifer. Sinkhole and other solution features have been formed throughout the region during the geologic past, although the limestone depression feature underlying the landfill may be due to recent dissolution activities.	The selected remedy includes implementation of institutional controls including deed restrictions, land use ordinances, physical barriers, and water supply well permitting prohibitions, and site access restrictions including fencing; construction of a groundwater extraction, treatment (air stripping and granular activated carbon), and discharge (reinjection) system in the Yard Trash Area (YTA); installation of a multi-layer clay cap over the YTA only; contingent installation of a passive gas collection and control system; construction of a storm water management system; groundwater monitoring; and implementation of long-term management controls including operation and maintenance of the groundwater treatment system and the YTA cap.	O&M: \$ 109,00 to 409,000 (for 25 years) Present Worth: \$ 5,191,000 (includes O&M cost above)
No ROD (8/3/98 conver- sation with Region 4 Superfund Staff)	Red-Penn Sanitation Company Landfill	Crestwood	KY	Commercial Industrial Hazardous Municipal	Chlorinated Organics (such as pesticides, aldrin, and chlordane, PCBs, selenium) Metals (such as lead and chromium) VOCs (such as toluene and xylene)	Soil Groundwater	The aquifer is Laurel Dolomite/OSGO. Approximately 850 people obtain drinking water from wells within 3 miles of the site. A public water intake is located about 250 feet downstream in Floyd's Fork, a major stream bordering the landfill. Creeks that border the site are used for fishing, swimming, and livestock watering.	Approximately 220 tons of drums and soil were removed from two areas on the property in 1986. Between 1990 and 1993, EPA evaluated the site for additional emergency response and no further removal action is recommended based on capping the landfill. A no action ROD is pending state and PRP agreement.	NA

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
01/96 (RODs Database)	Taylor Road Landfill	Hillsborough County	FL	Hazardous Residential Commercial Industrial	VOCs SVOCs Pesticide Inorganics	Groundwater	The site is located within an internally-drained portion of the Polk Upland karst escarpment called the Brandon Karst Terrain. Sinkholes, headlands of small drainage systems, and distinctive hills are located near the site. The surficial aquifer is represented by surficial sands, which are rarely saturated and a continuous surficial aquifer does not exist. The intermediate aquifer consists of residual clays and sandy clays of the Hawthorn Group. Because the intermediate confining system is not continuous at the site, the intermediate aquifer is considered not be present. The sinkhole activity seen in the site area creates the possibility that the landfill bottoms will collapse into the aquifer and cause widespread contamination.	The remedy selected includes implementation of institutional controls to restrict construction of new potable-water wells that would extract water affected by the Taylor Road Landfill; modification of existing County groundwater monitoring program; provision of County water service to about 20 residences; contingent expansion of monitoring well "ring" and provision of County water to additional residences; and natural attenuation with contingent corrective action if monitoring reveals that it is needed.	Primary Remedy: Construction/Capital: \$ 17,000,000 O&M: \$ Not stated Present Worth: \$ Not stated Contingency Remedy: Construction/Capital: \$ 7,000,000

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
08/28/91 (RODs Database)	Tri-City Industrial Disposal	Bullitt County	KY	Industrial Hazardous Drummed Liquid Waste	PCE TCE DCE Toluene Vinyl chloride	Groundwater	The site overlies Mississippian-age sedimentary rocks. The stratigraphic sequence of these rocks (from top to bottom) include the Salem Limestone, the Harrodsburg Limestone, and members of the Borden Foundation. The surficial aquifer is composed of the Salem and Harrodsburg Limestones, which are in hydraulic communication. This aquifer ranges from about 10 to 50 feet thick and is unconfined. Groundwater moves along preferential flow pathways between the overburden and the limestone surface and through fractures and solution channels along bedding planes. Geologic formations near the site are generally productive; however, because productivity is sporadic and unpredictable, springs are used as a water supply source more frequently than water wells. Groundwater recharge occurs primarily by infiltration of precipitation into the overburden or directly into rock outcrops. Groundwater occurs down-dip along preferential flow paths that follow bedding planes. Karst features are not developed within the sedimentary rock due to significant amounts of siltstone and shales interbedded within the limestones.	The remedy selected for OUI includes implementation of institutional controls including groundwater use restrictions; installation of a carbon adsorption system; treatment of contaminated groundwater using carbon adsorption and discharge of treated groundwater to tributaries downstream; conduct leachability test; regeneration or treatment and disposal of spent carbon off site; continuation of providing potable water to residents; conduct sampling of soil, sediment, and ambient air; groundwater, surface water, sediment, and ecology monitoring; and implementation of a worker health and safety program.	O&M: \$ 89,890 (for years 0 to 1); 70,686 (for years 2 to 3); and 66,330 (for years 4 to 30) Present Worth: \$ 2,098,000 (includes O&M cost above)

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
03/29/96 (RODs Database)	Tri-City Industrial Disposal	Bullitt County	KY	Industrial	NA	NA	The site overlies Mississippian-age sedimentary rocks. The stratigraphic sequence of these rocks (from top to bottom) include the Salem Limestone, the Harrodsburg Limestone, and members of the Borden Foundation. The surficial aquifer is composed of the Salem and Harrodsburg Limestones, which are in hydraulic communication. This aquifer ranges from about 10 to 50 feet thick and is unconfined. Groundwater moves along preferential flow pathways between the overburden and the limestone surface and through fractures and solution channels along bedding planes. Geologic formations near the site are generally productive; however, because productivity is sporadic and unpredictable, springs are used as a water supply source more frequently than water wells. Groundwater recharge occurs primarily by infiltration of precipitation into the overburden or directly into rock outcrops. Groundwater occurs down-dip along preferential flow paths that follow bedding planes. Karst features are not developed within the sedimentary rock due to significant amounts of siltstone and shales interbedded within the limestones.	Based on results of additional sampling, monitoring reports, and risk evaluation, no further remedial action is necessary. Treatment and monitoring of contaminated groundwater (OU1) will continue, as necessary.	NA

SUMMARY OF REMEDIAL ACTIONS FOR LANDFILLS IN OR NEAR KARST GEOLOGY FOR REGIONS 4 AND 7

ROD Date (Source)	Site Name	City or County	State	Type(s) of Landfill Wastes	Contaminant(s)	Area(s) or Media of Concern	Site Geology	Selected Remedy	Remedy Cost
REGION 7									
09/30/88 (RODs Database)	Fulbright Landfill	Springfield	MO	Hazardous Municipal Industrial	Acid Cyanide	Debris	The site overlies approximately 10 feet of alluvial soils consisting of weathered limestone and clays with variable permeability. Bedrock in the site area is a fractured, karst limestone with sinkholes. Upper bedrock groundwater and surface water run-off from the landfills discharge to adjacent rivers. Limestone bedrock underlying the landfills is generally about 100 feet thick. Bedrock overlies the Northview shale. The Northview shale are a series of limestone, shale, sandstone, and dolomite bedrock formations which are known collectively as the deep bedrock aquifer. The City of Springfield withdraws some of its drinking water from the deep bedrock aquifer from a well upgradient of the landfills. Groundwater discharge is away from the public drinking water supply and toward the landfills; this tends to reduce the potential for contamination of the public water supply.	The selected remedy includes implementation of institutional controls such as deed restrictions and groundwater use prohibitions; removal of drum and drum remnants; sampling of removed contents to determine hazardous characteristics; off-site treatment or disposal of removed contents; observation of leachate seeps during maintenance; and groundwater and surface water monitoring for a 30-year maintenance period.	Construction/Capital: \$ Not stated O&M: \$ Not stated Present Worth: \$ 270,400 (if disposed as hazardous waste) \$ 246,600 (if disposed as solid waste)

Notes:

EPA	U.S. Environmental Protection Agency
gpm	Gallon per minute
NA	Not applicable
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
POTW	Publicly-owned treatment works
PRP	Potentially responsible party
RCRA	Resource Conservation and Recovery Act
ROD	Record of decision
SVOC	Semivolatile organic compound
UST	Underground storage tank
VOC	Volatile organic compound